CLAIMS:

1. A fuel cell power system comprising:

a fuel cell which has an optimal voltage;

an energy storage device having a nominal voltage substantially similar to the optimal voltage of the fuel cell; and

an electrical switch that, in operation, selectively electrically couples the fuel cell to the energy storage device to charge the energy storage device.

2. A fuel cell power system as claimed in claim 1, and further comprising a plurality of additional fuel cells respectively having optimal voltages substantially similar to the optimal voltage of the first mentioned fuel cell.

3. A fuel cell power system as claimed in claim 1, wherein the fuel cell comprises multiple fuel cell subracks which selectively support respective fuel cell modules, and wherein the respective fuel cell modules can be operatively removed from the individual subracks while the subracks remain operational.

4. A fuel cell power system as claimed in claim 3, wherein the fuel cell comprises multiple fuel cell modules each including a housing enclosing a membrane electrode diffusion assembly, and wherein at least one of the modules can be removed from the fuel cell by hand, while the remaining modules continue to operate.

5. A fuel cell power system as claimed in claim 1 wherein the fuel cell comprises:

a subrack configured to support at least one ion exchange membrane fuel cell module;

at least one ion exchange fuel cell module supportable by the subrack; and

a DC bus which is electrically coupled with the at least one ion exchange fuel cell module when the ion exchange membrane fuel cell module is supported by the subrack.

6. A fuel cell power system as claimed in claim 1, wherein the electrical switch selectively electrically couples the fuel cell to the electrical charge storage device without any intermediate power conditioning or power conversion.

7. A fuel cell power system comprising:

a fuel cell which, in operation, converts chemical energy into direct current electrical energy, the fuel cell being defined by a plurality of independently operable fuel cell sub-systems;

a DC bus;

a switching circuit electrically coupled with the fuel cell sub-systems and configured to independently selectively couple the fuel cell sub-systems to the DC bus; and

an energy storage device electrically coupled with the DC bus and configured to be coupled to a load, and wherein the switching circuit selectively electrically couples a selectable number of the fuel cell sub-systems to the DC bus to supply direct current electrical energy to the energy storage device to charge the energy storage device.

8. A fuel cell power system as claimed in claim 7, and further comprising:

a power conditioner electrically coupled with the DC bus and the electrical charge storage device, and wherein the power conditioner, in operation, receives the direct current electrical energy and produces alternating current.

9. A fuel cell power system as claimed in claim 8, wherein the energy storage device comprises a battery; an ultra-capacitor; and/or batteries and ultra-capacitors and wherein DC electrical current from the fuel cell is selectively supplied to the battery; ultra-capacitor; and/or batteries and ultra-capacitors, in operation.

10. A fuel cell power system as claimed in claim 9, and further comprising:

a controller electrically coupled to the energy storage device and which, in operation, determines the charge of the energy storage device, and which is further electrically coupled to the switching circuit, and wherein the controller is configured to cause the switching circuit to couple a selected number of the fuel cell sub-systems to the DC bus to maintain the charge of the energy storage device.

11. A fuel cell power system as claimed in claim 10, wherein the fuel cell sub-systems are defined by respective fuel cell subracks which can be independently coupled to the DC bus.

12. A fuel cell power system as claimed in claim 10, wherein the switching circuit selectively electrically couples the fuel cell sub-systems to the DC bus without any intermediate power conditioning or power conversion.

13. A fuel cell power system as claimed in claim 7, and further comprising an additional fuel cell, and wherein the switching circuit is configured to independently switch the first mentioned fuel cell and the additional fuel cell for coupling to the DC bus.

14. A fuel cell power system as claimed in claim 7, wherein the fuel cell comprises a fuel cell stack.

15. A fuel cell power system comprising:

a plurality of fuel cells, the fuel cells respectively having substantially similar nominal voltages;

an energy storage device having a nominal voltage substantially similar to that of each of the fuel cells; and

electrical switching circuitry electrically coupled to the fuel cells and the energy storage device, and wherein the electrical switching circuitry is configured to electrically couple a selectable number of the fuel cells to the charge storage device to maintain the voltage of the charge storage device above a predetermined voltage.

16. A fuel cell power system as claimed in claim 15, wherein the fuel cells are defined by fuel cell stacks.

17. A fuel cell power system as claimed in claim 15, wherein the fuel cells are independently operable.

18. A fuel cell power system as claimed in claim 15, wherein the fuel cells are constructed and arranged so as to be able to be removed and replaced while the fuel cell power system is in operation.

19. A fuel cell power system comprising:

a fuel cell which has a nominal operating voltage;

an energy storage device having a nominal voltage substantially similar to the nominal operating voltage of the fuel cell;

an electrical switch selectively coupling the fuel cell to the energy storage device; and

a controller coupled in voltage sensing relation relative to the fuel cell and the energy storage device, and further coupled in controlling relation relative to the electrical switch, the controller selectively controlling the switch to selectively electrically couple the fuel cell to the energy storage device to maintain the voltage of the energy storage device above a predetermined threshold.

20. A fuel cell power system as claimed in claim 19, wherein the energy storage device comprises a plurality of batteries.

21. A fuel cell power system as claimed in claim 19, wherein the energy storage device comprises a capacitor.

22. A fuel cell power system as claimed in claim 19, wherein the energy storage device comprises a battery and a capacitor.

23. A fuel cell power system as claimed in claim 19, wherein the controller electrically couples the fuel cell to the energy storage device without any intermediate power conditioning or power conversion.

24. A fuel cell power system comprising:

an inverter having a DC input and having an AC output configured to be coupled to a load;

a battery coupled to the DC input;

a plurality of fuel cell sub-systems; and

circuitry configured to measure the voltage of the battery and selectively couple a selectable number of the fuel cell sub-systems to the battery in response to the measured voltage of the battery.

25. A fuel cell power system as claimed in claim 24 wherein the fuel cell sub-systems coupled to the battery are coupled to the battery in parallel.

26. A fuel cell power system as claimed in claim 25 wherein the DC input of the inverter is coupled to the battery in parallel.

27. A fuel cell power system as claimed in claim 26 wherein the battery has a nominal voltage of at least about 12 volts.

28. A fuel cell power system as claimed in claim 27 wherein the respective fuel cell sub-systems comprise respective subracks configured to respectively receive a plurality of fuel cell membranes.

29. A fuel cell power system as claimed in claim 28 and further comprising circuitry configured to prevent one of the subracks from backfeeding another subrack.

30. In a fuel cell power system including a power conditioning device having a DC input and having an electrical output which is configured to be coupled to a load; an energy storage device coupled to the DC input; a plurality of fuel cell sub-systems; and circuitry configured to measure the voltage of the energy storage device and selectively couple the fuel cell sub-systems to the energy storage device in response to the measured voltage of the energy storage device, a method comprising:

(a) measuring the voltage of the energy storage device;

(b) determining if the measured voltage is less than a first threshold and, if so, proceeding to step (c) and, if not, proceeding to step (d);

(c) de-coupling all the sub-systems from the energy storage device;

(d) determining if the measured voltage is greater than or equal to a second threshold and, if so, proceeding to step (e) and, if not, proceeding to step (g);

(e) determining if all sub-systems are de-coupled from the energy storage device and, if so, proceeding to step (a) and, if not, proceeding to step (f);

(f) decoupling all of the sub-systems from the energy storage device;

(g) determining if the measured voltage is greater than or equal to a third threshold and, if so, proceeding to step (h) and, if not, proceeding to step (j);

(h) determining if all sub-systems are de-coupled from the energy storage device and, if so, proceeding to step (a) and, if not, proceeding to step (j);

(i) decoupling one of the sub-systems coupled to the energy storage device from the energy storage device;

(j) determining if the measured voltage is greater than or equal to a fourth threshold and, if so, proceeding to step (k) and, if not, proceeding to step (m);

(k) determining if all sub-systems are coupled to the energy storage device and, if so, proceeding to step (a) and, if not, proceeding to step (l);

(l) coupling one of the sub-systems de-coupled from the energy storage device to the energy storage device;

(m) determining if all sub-systems are coupled to the energy storage device and, if so, proceeding to step (a) and, if not, proceeding to step (n); and

(n) coupling all sub-systems to the energy storage device.

31. A method according to claim 30 wherein the power conditioning device can be turned on and off, the method further comprising turning off the power conditioning device after step (c) and then proceeding to step (a).

32. A method comprising:

providing a fuel cell having a nominal voltage;

providing an energy storage device having a nominal voltage which is substantially similar to the nominal voltage of the fuel cell and electrically coupling the energy storage device to a load; and

selectively electrically coupling the fuel cell to the energy storage device to substantially maintain the energy storage device above a predetermined voltage threshold.

33. A method according to claim 32, wherein providing a fuel cell comprises electrically coupling a plurality of selectively removable fuel cell subracks together.

34. A method according to claim 32, and further comprising:

providing a controller coupled in voltage sensing relation relative to the fuel cell and to the energy storage device;

monitoring the voltage of the energy storage device and the voltage of the fuel cell; and

controlling the electrical coupling of the fuel cell to the energy storage device with the controller responsive to the monitoring.

35. A method according to claim 34, and further comprising:

providing a power conditioning device and electrically coupling the power conditioning device to both the energy storage device and the load.

36. A method according to claim 35, and further comprising:

electrically coupling a sensor to the energy storage device to sense the voltage of the energy storage device and the voltage of the fuel cell, and electrically coupling the sensor to the controller.

37. A method according to claim 36, wherein providing a fuel cell comprises:

providing multiple independently operable fuel cells, and wherein the independently operable fuel cells may become inoperable without causing the remaining fuel cells to be rendered inoperable.

38. A method according to claim 32, wherein providing a fuel cell comprises:

providing a subrack for releasably supporting a plurality of ion exchange membrane fuel cell modules; and

providing a DC bus which releasably electrically couples with the ion exchange membrane fuel cell modules and electrically coupling the DC bus to the energy storage device.

39. A method comprising:

providing a plurality of independently operable fuel cells which convert chemical energy into direct current electrical energy;

providing an energy storage device;

coupling the energy storage device to a load;

monitoring the voltage of the energy storage device; and

varying the number of the fuel cells coupled to the energy storage device based upon the voltage of the energy storage device.

40. A method as claimed in claim 39, wherein a switching circuitry varies the number of fuel cells coupled to the energy storage device.

41. A method as claimed in claim 39, wherein providing an energy storage device comprises providing a battery.

42. A method as claimed in claim 39, wherein the fuel cells coupled to the energy storage device are coupled by a DC bus.

43. A method as claimed in claim 39, wherein the energy storage device comprises a battery.

44. A method as claimed in claim 39, wherein the energy storage device comprises a plurality of batteries.

45. A method as claimed in claim 39, wherein the energy storage device comprises at least one capacitor.

46. A method as claimed in claim 39, wherein the energy storage device comprises a capacitor and a battery.

47. A method as claimed in claim 39, wherein the energy storage device comprises an ultra-capacitor.